Thesis/
Reports
Towle,
E. L.

FIRE CONSIDERATIONS IN FOREST PLANNING

Everett L. Towle

FIRE CONSIDERATIONS IN FOREST PLANNING

A Fire Management Proposal for Inclusion in FSM 1920
based on the
National Forest Management Act of 1976
Section 6, and the
Draft National Forest System
Resource Planning Regulations

JUNE 1978

Prepared by the "Fire in Land Management Planning" Task Force.

Everett L. Towle, Chairman - Director, Policy Analysis, WO
James F. Mann, Staff Coordinator - Fire Management, WO

Members:

Charles W. Philpot, Assistant Director, PSW
John W. Russell, Assistant Director, LMP
Ronald Zeleny, Colorado State Forest Service
David F. Jolly, Forest Supervisor, Shawnee NF, R-9
Allen J. West, Forest Supervisor, Los Padres NF, R-5
Harold T. Nygren, Land Management Planning, R-1

LIBRARY COPY
ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION

SUMMARY

FIRE IN LAND MANAGEMENT PLANNING: REQUIREMENTS FOR INTEGRATED PLANNING-- Preliminary Analysis, June 1978

PREAMBLE

The Forest planning regulations (in draft) required by the National Forest Management Act of 1976, direct the development of Regional and Forest plans for the management of National Forest land and Forest Service programs. A planning process is outlined in the regulations.

This discussion is aimed at the process of preparing direction for integration of fire management considerations in the Forest planning process.

Fire Management Information and the Planning Process

The planning process outlined in the NFMA regulations (5/11/78 draft) specifies that the planning process will consist of at least the following steps:

1. Identification of issues, concerns, and opportunities.
2. Planning criteria.
3. Information and data inventories.
4. Assessment of management situation.
5. Formulation of alternatives.
6. Estimated effects of alternatives.
7. Alternative evaluation and selection.
8. Implementation.
9. Monitoring
10. Revision and amendment.

The first step in providing information needed to integrate fire management and Forest planning is to determine what information is needed.

Fire management and related information will be needed to initiate fire management consideration in the planning process (why is fire management information relevant?); to assure that information is being used in the process (How will it change the result?); and to adjust the process (how can fire management-Forest planning integration be more effective?).

ISSUES, CONCERNS AND OPPORTUNITIES

Reference 219.8(c)(1)

An identification of issues, concerns and opportunities. The interdisciplinary team shall identify the major public issues, management concerns and known management opportunities related to forest planning and those plans being developed, revised, or amended.

DEFINITIONS Reference 219.3

1. *Public Issue: - A subject or question of widespread public discussion or interest regarding management of National Forest System lands.*

2. *Management Concern: - A matter for consideration in the management of National Forest Sustem lands or resources, especially those appropriate for resolution at, or guidance of, a particular planning level. Such concerns include policy, goals, and objectives.*

3. *Management Opportunity: - Circumstances that are judged to make certain actions possible, with an acceptable probability of success, advantage or gratification. Includes such circumstances or factors as availability, capability and suitability of land for certain resource activities.*

Following are examples of fire management issues, concerns and opportunities by environmental and social effects. The interdisciplinary team actually determines that issues, concerns, and opportunities that will be addressed in any planning to be done.

I. ENVIRONMENTAL EFFECTS

1. Fish and Wildlife Resource

A. Public Issues

1. Safety of animals during wildfire.
2. Production of adequate wildlife species in areas protected from wildfire.
3. Relation of fire exclusion and wildlife habitat.

B. Management Concerns

1. Animal accessibility and quality forage in areas protected from wildfire.
2. Potential damage to productive fisheries as a result of wildfire.

C. Management Opportunities

1. Maintain or enhance species diversity by using fire as a management tool.
2. Produce perferred plant species and new growth to enhance wildlife.
3. Open dense vegetation areas for better wildlife access.

2. Range Resource

A. Public Issues

1. Prescription fire to increase forage for domestic livestock.
2. Loss of forage due to fire exclusion.

B. Management Concerns

1. Maintenance or enhancement of animal unit months when fire is excluded.
2. Range improvement protection during wildfire.

C. Management Opportunities

1. Increase red meat production using fire as a management tool.
2. Maintain fire climax ecosystems to maintain threatened and endangered plant species.

3. Recreation Resource

A. Public Issues

1. Closure of dispersed recreation areas and recreation opportunities because of hazardous conditions.
2. Effect of wildfire on quality fishing and hunting.

B. Management Concerns

1. Damage to recreation facilities, including trails, from wildfire.
2. Public safety.

C. Management Opportunities

1. Use prescription fire to reduce hazard around recreation facilities.
2. Use of prescription fire to permit safe access and dispersed recreation use.
3. Exclude all wildfire in developed recreation sites with a highly trained and mobile organization.

4. Timber Resource

A. Public Issues

1. Effect of fire on sustained yield.
2. Can productive timber stand be reestablished after wildfires?
3. Permitting fire to burn valuable timber.
4. Prescribe fire as part of timber management.

B. Management Concerns

1. How to treat both natural and activity fuels to minimize wood fiber losses and harmful results to other resource systems.
2. Ability to contain prescription fire without escape into valuable timber stands.
3. Changes in species composition because of fire exclusion.
4. Impacts of exclusion of fire on Insect and Disease.

C. Management Opportunities

1. Use of prescription fire to keep fuels at acceptable levels.
2. Use of prescription to reduce undesirable competitive species and maintain stands in healthy and vigorous state.
3. Exclude all unplanned ignitions in valuable timber through a highly trained and mobile organization and through good timber management planning.

5. Water and Soil Resource

A. Public Issues

1. Potential flooding and downstream damage following fire.
2. Water quality following fire.
3. Sedimentation in impoundments.

B. Management Concerns

1. Effect of fire or lack of fire on water quantity and quality.
2. Sediment production, erosion and landslides from a burned watershed.
3. Effect of periodic burning on watershed productivity.

C. Management Opportunities

1. Ability to effect timing of water supply by use of fire.
2. Ability to increase water yield and maintain acceptable water quality by use of fire.
3. Reduce downstream damage by managing watershed with fire under management guidelines rather than after wildfire.
4. Exclude all wildfire to prevent erosion and downstream damage using a highly trained and mobile organization.

6. Wilderness Resource

A. Public Issues

1. Is there a need to control wildfire in classified Wilderness?
2. The effect of exclusion of fire on the natural ecosystem.

B. Management Concerns

1. Ability to suppress fire, within given objectives, without presuppression activities.
2. Safety of Wilderness user during wildfire.
3. Additional suppression costs within classified Wilderness because of no presuppression facilities.

C. Management Opportunities

1. Use of prescription fire to maintain natural ecosystems.

II. SOCIAL EFFECTS

1. Human and Community Considerations

A. Public Issues

1. Public safety during wildfire.
2. Moral obligation to protect private property.
3. Protection of homes, agricultural improvements, transportation facilities and other trade-offs.
4. Effect of fire on air pollution.
5. Cost of fire suppression.

B. Management Concerns

1. Protection of firefighter during wildfire.

2. Reduction of fire suppression costs.
3. Prevention of major conflagrations.
4. Liability because of escaped fires onto lands of other ownerships or destruction of facilities due to the fire or aftermath.
5. Ability to contain or control fire where desired.

C. Management Opportunities

1. Use fire to provide safety zone to protect lives and property.
2. Plan the use of fire to minimize pollution effects on humans.
3. Use prescription fire to create visual diversity and eliminate visual impacts of catastrophic fire.
4. Construct and maintain fuelbreaks in key locations where areas are susceptible to major wildfires.
5. Exclude fire through a highly trained and mobile fire suppression organization.
6. Innovative prevention programs.
7. Interagency cooperation.

Reference 219.8(c)(2) Planning Criteria

Process: Criteria that will guide how the planning is intended to occur must be developed and recorded. Planning Criteria are to be used for: the collection and use of data, the design and formulation of alternatives, analysis and estimation of effects of alternatives, evaluation of differences between alternatives and the selection of an alternative. Planning criteria must be responsive to applicable laws, regulations, policy, goals, objectives, public issues, and management concerns and known opportunities. Planning criteria must reflect the General Planning Requirements and Specific Standards and Guidelines in sections 219.8(d) and (e).

Definition: Reference 219.3 "Planning Criteria" - Criteria established prior to or during the planning activity to guide judgments or decisions related to inventories, formulation of alternatives, analysis of the effects of implementation, evaluation of alternatives, identification of the preferred alternative, and documentation.

Specific planning criteria for fire management considerations to be included in development of the Forest Plan are given here.

1. Intensity of the planning effort is related to the magnitude of the issues, concerns, and opportunities. The extent of fire management considerations in the planning process are established in the following criteria:

a. Establish fire occurrence history by Capability Area. (To be defined yet. Conceptually similar to an ecological land unit, land response unit, etc.) Record and map, by decade, the number, locations, sizes, intensities, time and date of fire occurrence, fire causes, frequency and fuel types. Include all historical records and studies.

b. Review continental fire regimes and lightning patterns and record for the planning unit.

c. Document the natural role of fire, including fire cycles, in the evolution and development of the ecosystems and their dynamics by Capability Area.

d. Record "fire specific" direction from the Regional plan.plan.

e. Record "fire specific" management concerns, opportunities and public issues related to fire.

f. Review and record, if appropriate, established fire management policy and Regional fire management objectives.

2. Establish planning or Evaluation Criteria to design and formulate alternatives, analyze and estimate effects of alternatives, evaluate differences among alternatives, and select an alternative, to facilitate the preparation of a quality Forest Plan. Criteria established will be used to evaluate the use of fire and fire protection for each alternative. These criteria may be expanded by the planner to better address the specific situations.

a. Evaluate the "Use of Fire" (include or exclude fire) by Capability Area for:

1. Vegetative succession
2. Resource Output Productivity

b. Evaluate "Fire Protection" for:

1. Economic Effects - The Forest Planning process establishes intolerable loss levels by Capability Area for each resource and facility. Include both onsite and affected offsite values. Establish the "values at risk." Include the fire management total-cost and net loss economic criteria.

2. Protection Effects - For each Capability Area, determine the protection activities required to implement each alternative.

3. Environmental Effects - For each Capability Area, record the intolerable loss levels for each alternative established through the planning process. Specify the level of protection required to achieve each output.

4. Social Effects - For each Capability Area, established the social impacts resulting from alternative levels of fire protection and fire use.

Reference 219.8(c)(3)

"Information and Data Inventories. Forest Service officials shall assure that: (i) Methods used to gather data for planning are consistent with those used to monitor consequences of activities resulting from planning; (ii) Data are collected and stored for ready retrieval and comparison; (iii) Data inventories are compiled only to the degree necessary to meet specific information needs, but including sufficient detail for alternative comparison; and (iv) There is an evaluation of accuracy and effectiveness of Data."

Information collected for Forest Planning should have a specific purpose in the planning process. It should only be as detailed as needed to contribute to resolution of issues and concerns and utilization of opportunities.

The intensity of inventory must be sufficient to allow integration with other information used in the planning process, and to build necessary bridges with superior or subordinate planning efforts. These "bridges" are vital to achieving integrated plans that can be implemented.

The level of data intensity for plan preparation must be directly comparable to the level required to monitor plan implementation.

Time relationships are particularly important to fire management information. Climate, vegetation, and fire cycles of varying length must be built into the determinations predicting change.

The quality of fire information required is the key to setting information standards and guidelines for the planning unit.

Standards and Guidelines

Information standards and guidelines shculd be prepared for the following types of information:

a. Information that may be used to define management opportunities. (See Issues, Concerns, and Opportunities.)

b. Information that may be used to identify and analyze issues and concerns. (See Issues, Concerns, and Opportunities.)

c. Information that may be used to establish criteria for the formulation and evaluation of alternative land management policies, outputs, prescriptions, and activities. (See Planning Criteria.)

d. Information that may be used to establish a baseline and monitor change following plan implementation. (See Monitoring.)

Types of Fire Information Requirements

1. Baseline information - This includes the historical record of past events and effects which affect the present or future condition of the land, its resources, and man's ability and desire to use those resources.

Historical record (see Planning Criteria):

An analysis of historical fires, fuel conditions and climatic patterns.

Vegetative cycles (plant community dynamics) and their related fire cycles.

Fuel characteristics--An appraisal of the present fuel situation and its significance in fire management.

Fire behavior--The expected behavior of fire, based on predictable patterns of fuel and weather conditions, and how it affects fire management.

Fire effects--The positive and negative conseqneuces of fire on the land and its resources, over its range of expected behavior.

Fire management costs--Current and past costs associated with fire management activities.

2. Predictive information - See discussion of Capability Areas, Step 2, Planning Criteria.

Specific Requirements

I. "Methods used to gather data for planning must be consistent with those used to monitor consequences of activities resulting from planning."

- Methods and data used to develop fire management strategies must be consistent with feasible monitoring methods.

- Methods and data needed to adequately consider fire management in Forest planning must be such that change in the fire management situations, and in the management implications for other resources, can be measured as the plan is implemented.

- The accuracy and effectiveness of fire management data and information will be evaluated as a part of the monitoring process.

II. "Data are collected and stored for ready retrieval and comparison."

- Fire management data and information (baseline information) will be stored in an information management system compatible with other resource information used in the Forest plan, and with supporting fire plans.

- Data and information collected and evaluated during the monitoring process will be used to update the fire management information file, and to maintain a record of change from the baseline information.

III. "Data inventories are compiled only to the degree necessary to meet specific information needs, but including sufficient detail for alternatives comparison."

- Fire management information and data collected will be limited to that necessary to integrate fire management direction with the policies, output targets, and prescriptions in the Forest plan.

IV. "There is an evaluation of accuracy and effectiveness of data."

- The estimated accuracy and effectiveness of fire management data and information collected will be documented and maintained as a part of the Forest plan information base.

- Estimates of accuracy and effectiveness will be modified according to new information obtained in the monitoring process.

Reference 219.8(c)(4)

"Assessment of the management situation. There must be a determination of the opportunities or the ability of the lands being assessed to produce and sustain levels of goods, services, and uses under resource activities that are physically, biologically, economically, and socially acceptable. There must be a determination of the relationship of opportunity in comparison to the local, regional, and national needs and demands, considering historical, current, and projected information."

Reference 219.8(d)(2)

Assessment of the management situation must consider those requirements specific to each resource in section 219.8(E). In general, assessment for all resources must consider:

The basic approach in the "assessment" state is to determine first the natural fire regime by plant community, then the changes induced by man, and finally, the predicted futures with and without current and proposed management.

(i) Availability of the resources for various uses

A discussion of the natural role of fire in the ecosystems within the Capability Area and its impact on other developments should be included. There should be an assessment of the relationship between fire history and flora and fauna diversity and development and changes occurring due to modification of natural fire occurrence. A discussion of expected changes in resource availability under current and projected fire occurrence and behavior should be included. The availability of a resource could be limited by fire hazard considerations.

(ii) Capability to produce various sustained levels of goods, services, and use

Since fire, including fire exclusion, has positive and negative effects on the capabilities of lands to produce sustained levels of goods, services, and use, some analysis and discussion is needed. The probability of large wildfires needs to be addressed. In some ecosystems, total fire exclusion will change sustained resource production and prevent the maintenance of natural ecosystem dynamics. Special consideration may be needed in relation to habitats of threatened and endangered species.

(iii) Feasibility of historical, current, and proposed activities

This section of the assessment should include a discussion about historical fire management activities and their cost and effectiveness as well as any conflicts with resource management objectives. Potential changes in level and mix of fire management activities and some of the reasons these changes will occur should be included. Economic and resource trade-offs should be part of the discussion and analysis.

(iv) Management intensity, current and historical

The fire history of the forest should be used to assess the trends in fire occurrence, fire size distribution, intensity, and impact. Costs, fire management mix, and dollars over time should be displayed. Fire management capabilities and effectiveness and the role of fire management in the protection of structures and improvements should be evaluated. Additionally, the impact of various historical and current resource management intensities on fire occurrence size and impact should be included.

(v) Demand analysis for each resource use, both for the present and future.

This analysis, if done in the economic sense of demand, must include cost of various outputs of each resource under different management intensities. Costs have to include fire management requirements and therefore, should be included in the analysis.

(vi) Minerals

The impacts of fire occurrence and hazard on mineral activities should be evaluated and vice versa.

(vii) Opportunities to protect, and where appropriate, enhance soil productivity.

A discussion here should include the opportunities to protect soil productivity, or modify it by changing fire management activity mixes, reducing suppression impacts, using prescription fire and making fire management more efficient. Impact of fire frequency on soil productivity should be included.

Specific Resource Considerations

1. Fish and Wildlife

Fire has many potential implications related to the assessment of special habitat needs. Fire and fire-use have impact on program outputs. The exclusion of fire from many ecosystems will limit wildlife management outputs and decrease management opportunities. Fire management and fire-use activities may be a positive or negative impact on the threatened and endangered species. The impact of fire occurrence on facilities and capital improvements may need assessment.

2. Range Resource

Under the specific requirements of the regulations, there are several items where fire is a consideration. The condition, long term trend and successional stage of range fire occurrence and behavior. Future expected trends are also related to future fire management alternatives and frequency distribution of fires, suitability, capability, and productivity are also fire-related assessment parameters. The potential for wildlife and livestock competition can be impacted by fire use and fire management policies. Facilities and physical improvements should be included.

3. Recreation

The impact of recreation on fire occurrence and the impact of fire occurrence on recreation may limit the areas available for some types of recreation experience. The visual resource can be enhanced, maintained, or degraded, depending on fire management activities and their

effects. Facilities and capital investments should be included in the assessments. Consideration of potentials for trade-off of area use is a consideration.

4. Timber

The role of fire in productivity, species composition, and sustained-yield should be included in the timber assessment discussion. Additionally, the impact of various timber management activities on fire occurrence and behavior should be addressed. Fire considerations may enter into the delineation of timber and nontimber lands.

5. Water and Soil Resources

The relationships between fire occurrence and fire behavior and water quality, quantity, peak volumes, offsite damage, and storage degradation should be included in water and soil assessment. In fire-type ecosystems, the role of fire in nutrient cycling and availability should be discussed. The relationship between fire frequency and soil loss and degradation should be included.

6. Wilderness Resource

The primary area of concern when assessing the wilderness resource is the relationship between fire occurrence, size, and behavior on the ecosystem dynamics of the area. Since maintenance of natural ecosystem dynamics is an objective of wilderness management and fire may play a primary role, it becomes an important area of discussion. Another area for discussion is the impact of successful fire exclusion on future fire behavior and the need for fire use to get systems back into natural condition. The relationship between fire management policy alternatives in proposed wilderness and impacts outside of wilderness should be addressed.

Reference 219.8(c)(5)

Formulation of Alternatives. "A reasonable range of management alternatives must be formulated which reflect the issues identified through the public involvement process and reflect management concerns and opportunities in addition to the general planning requirements."

Each Forest plan alternative will describe the most appropriate level of protection and use of fire that supports and protects the Forest to permit achievement of resource outputs and services for each alternative. The appropriate level of protection and use of fire for each alternative will be determined from an analysis of options that indicates least cost plus net loss and also includes intangible considerations.

Reference 219.8(d)(3)

Formulation of alternative plans must provide for:

(i) Multiple use and sustained-yield of fish and wildlife, range, recreation, timber, wilderness, and water, and the ability of land, air, soil and water to produce goods and withstand uses in perpetuity.

Intolerable loss is the level of damage (net loss) greater than the resource output that can be sustained. This is equivalent to resource long term sustained-yield capability. It also includes protection of capital investments and facilities at a level that allows for reasonable risks and loss that permits sustained outputs at the described alternative level.

-- Economic Analysis - Establish intolerable loss levels for each resource and facility. Include both onsite and affected offsite values. Establish the "values at risk."

Consider the following costs:

a. Presuppression cost
b. Prevention cost
c. Projected costs

    (1) Suppression costs
    (2) Rehabilitation costs

d. Total protection costs
e. Net loss projection

    (1) Damages
    (2) Benefits

f. Total-cost and net loss

(ii) The goals and objectives of the Regional Plan, other management concerns, and public issues.

This includes specific fire management direction from the Regional Plan such as mobility requirements, detection, etc. Examples of management and public concerns include use of fire, smoke management, offsite damage, etc.

(iii) Management and investment opportunities to maintain and increase productivity use including increased utilization of timber products.

This includes "Fire Use," either excluding or including, for the maintenance, enhancement and protection of the resources. Use of fire will be a part of the resource discussion and not as a fire management item.

1. Vegetative succession

    a. Maintenance of a seral or climax stage.
    b. Conversion to a seral or climax stage.
    c. Protection of a seral or climax state.

2. Resource output productivity

    a. Maintenance of current productivity.
    b. Enhancement for increased productivity.
    c. Protection of productivity.

(iv) The management systems that will be applied.

Develop proposed fire management systems for each Capability Area. Capability Area Pars (CAPS) is a fire management system for converting Forest Plan alternative strategies into Fire Management Direction.

The Forest planning process includes fire management input prior to the development and selection of planning alternatives. Once specific alternatives are selected for the forest plan and capability areas, there is still the difficult problem of converting the resource objectives and outputs of that alternative into fire management direction. This conversion should lead to quantified values such as number of fires, size distribution of fires, and perferred fire intensities. Capability Area Pars is one way in which to accomplish this conversion and provide fire management objectives. CAPS can be evaluated over the planning period in the monitoring process.

Capability area pars are different than the old static par concept. CAPS can change during the year as fire effects (intensity) changes. They can also be quite different for different capability areas.

They are not developed by the Fire Management staff, but by the inter-disciplinary planning team. As a member of that team, the fire manager must be prepared to describe fire intensity and fire size in such a way that each functional expert can determine the beneficial and detrimental effects or the impacts on the resource outputs. The various functional values must be integrated by the team to produce agreed-to set of values for each capability area.

EXAMPLE OF CAP MATRIX FOR A CAPABILITY AREA

The fire size distribution and size class breakdown can be different for each capability area. The matrix can be expanded in both directions. Fire intensity can be expressed by the Energy Release Component of the National Fire Danger Rating System broken down by adjective classes.

The process used to develop the following CAP matrix starts with a determination of the allowable burned acres for the planning period within the capability area expressed as a percent of the area and delineated by intensity level. The interdisciplinary team then gives some expression of the described spatial and temporal distribution of these burned acres by allocating them across the matrix by fire size and intensity, and indicating a target maximum allowable number of fires per year for each class. Fire management must be prepared to keep the matrix realistic in terms of achieving the desired distribution based upon the probability of large fires expected to occur in the capability area. The total number of fires in the 10-year planning period is then determined by relating back to the allowable acres burned in a capability area by intensity level.

The CAP matrix applies only to unplanned ignitions, but burned area pars will reflect expected opportunities for these ignitions to be used to accomplish fire prescriptions. In addition, each resource staff can use it to help plan its fire-use strategies by developing plans to add additional burn acres to those expected in the planning period from unplanned ignitions. The CAP matrix is primarily used to develop the fire management organization and evaluate its effectiveness. It does not define specific fire location or fire-use needs. These will be covered in functional and operational plans developed by resource specialists.

There may be other ways in which forest management objectives can be converted into fire management direction. CAPS shall be used as a minimum in the forest planning process.

Areas of similar management (CAPS) may be aggregated for analysis.

Where the "Use of Fire" is planned, fire prescriptions are required.

(v) Transmission corridors needed to meet public utility needs and the road system or other transportation needs.

Include coordination of protection requirements with the transportation system for suppression access and transportation system planning with fire planning, such as FOCUS. Include prevention activities for transmission lines.

FIRE SIZE CLASS (ACRES)

FIRE INTENSITY

	0-19	20-99	100-499	500-1000	The 10-year allowable burned area within the capability area (% of area)*
Low	5 / No preference**	10 / 15	10 / 3	5 / 1	30
Med	2 / No preference**	2 / 10	1 / 1	1 / 1	6
High	1 / 10	1 / 2	0 / 0	0 / 0	2

% of allowable burn by size class and intensity

Maximum number of fires in 1 year by size class and intensity

*This percent multiplied by the total acres in the Capability Area gives the allowable burn target in acres by intensity level for 10 years.

**"No preference" is a possible resource-management-oriented option; fire management would, in its planning process, need to set some upper bound for ignitions as they influence its capability to meet overall goals.

(vi) Fire management consisting of fire protection activities including prevention, presuppression, suppression, and fuel management, and fire use including prescription fire for protection, enhancement and maintenance of resource productivity.

-- Protection Effects - For each Capability Area determine the effects of protection activities for each of the following criteria:

a. Methodology constraints - Methods of suppression action that are not to be used within the Capability Area. (Examples: Mechanized line building equipment, colored retardant, etc.)

b. Cooperator Capability - The current capability of cooperators to respond to suppression objectives within the protection area.

c. Prevention Capability - The prevention actions necessary to deal with the protection objectives.

d. Detection Capability - The detection requirements necessary to deal with the protection objectives.

e. Support and Facilitating Services - The requirements necessary to deal with the protection objectives.

f. Aviation Operations - The aviation capability requirements necessary to support protection actions dealing with the protection objectives.

g. Attack Forces - The initial attack actions necessary to deal with the protection pbjectives. Forces should include both those funded for protection and those for other than protection purposes but are available for fire suppression.

h. Reinforcement Forces - Those forces available to reinforce initial attack forces when a fire escapes the capability of initial attack forces to contain it within established objectives.

(1) National interagency forces.
(2) Regional interagency forces
(3) Local reinforcement capability.

i. Fire Preparedness requirements - The preseason, post season, emergency manning requirement required to deal with the protection objectives.

j. Preattack - Actions necessary prior to a fire ignition which are prepared to facilitate the suppression actions on the fire and be responsive to the protection objectives.

k. Firefighter personnel safety - Those actions necessary to assure the safety of firefighter personnel responding to the protection objectives.

l. Fuels management - Actions necessary to assure the proper manipulation of fuels to reduce or maintain the level of Forest flammability necessary to respond to the protection objectives.

   (a) Activity fuels.
   (b) Natural fuels.
   (c) Preattack Fuelbreaks.
   (d) Vegetative manipulation (i.e., mosaic pattern or diversity manipulation).
   (e) Public/Private land interface.

(vii) Proposed activities for the protection of the resources, such as insect and disease.

(viii) Avoiding adverse effects and incompatible development in flood plains.

Include consideration for potential offsite damage such as increased water runoff and movement of soil. This can be estimated by an economic analysis based upon historical fires.

(ix) Regeneration of vegetation where necessary.

Consider the use of fire in site preparation and protection of regeneration.

(x) Known trends and probable changes in demand.

Include the relationship of plan alternatives to cooperator actions and cooperative agreements.

Reference 219.8(c)(6)

"Estimated effects of alternatives. The physical, biological, economic and social effects of implementing each alternative must be estimated using the appropriate requirements and the proper standards and guidelines in "General Planning Requirements" and "Specific Standards and Guidelines."

The effects of Forest Plan alternatives must be determined in order to compare the relative consequences both quantitative and qualitative, of Forest Plan alternatives. Previously, established evaluation criteria must be used to reduce dispute over the relative importance of some effects or consequences over others.

Comparison of the effects of various fire management options or mix of options among wildfire, prescription fire and fire exclusion (protection) will be an interactive process between fire management and resource specialists. This interactive process will continue until a single fire management system is selected for each Forest Plan Alternative.

Estimation of effects and comparison of fire management systems must at least consider the following.

A. Impacts on resource outputs.

B. The expected costs of implementation, including operation and maintenance.

C. Impacts on the physical and biological factors including but not limited to:

1. Soil, water and air quality and quantity.
2. Diversity or changes in diversity of plant and native animal species, both existing and expected onsite or offsite.

D. Impacts on social factors including but not limited to:

1. Population and safety.
2. Employment and income level.
3. Education and scientific.
4. Cultural values.
5. Other entities, plans, goals and objectives.

E. Impacts on economic factors including economic efficiency.

F. Contribution towards attaining the objectives and policies stated in the Planning Criteria.

Reference 219.8(c)(7)

Alternative evaluation and selection. A comparison of the alternatives and their effects must be made and evaluated according to the planning criteria. The Forest Supervisor shall identify and select an alternative and document the basis of his decision in the environment statement for recommendation to the Regional Forester for his approval.

Evaluation and comparison of the single fire management option among each of the Forest Plan Alternatives will be necessary and must continue to be an interactive process.

Evaluation criteria are established early in the planning process and should be based on economic, social, environmental, protection feasibility, resource objectives and the identified issues.

In order for the Forest Supervisor to document the basis for selecting an alternative, the single fire management option for each Forest Plan Alternative should be included. Documentation of the selection of the final Forest Plan Alternative will include those factors which are recognized to affect existing fire management plan.

Reference 219.8(c)(9)

Monitoring. Effects of management activities must be monitored for consistency with standards established in the Forest Plan. The Forest Supervisor shall periodically review the plan and compare monitoring results to standards in the Forest Plan to determine the need for revisions and amendments.

Fire management activities, associated with the environmental, social and economic effects implemented in the forest plan, will be monitored using a statistically sound sample. The amount of monitoring effort should be proportional to the size and complexity of the fire problems. Monitoring discussion will include: -

1. Those items to be measured and frequency of measurements; such as: -

    a. Fuel loading tons/acre.
    b. Average age class of brush.
    c. Fire presuppression and suppression costs.
    d. Environmental effects as related to the fire activities,, such as: water yield, sediment production, etc.
    e. ETC.

2. The expected precision and reliability of monitoring the effects of fire management activities.

3. Time when evaluation reports will be prepared.

The effect of implementation of fire management activities on the various resource systems will be measured over a period of time, such as five to ten years. This will be necessary because annual differences in weather can have a major influence on resource system outputs. The effect of exclusion from fire, prescription fire or wildfire on resource system outputs and objectives must be analyzed with effects of other management activities that affect those same outputs and objectives. Established standards that relate indirectly to resource outputs can be measured on a shorter time period. These would be factors related directly to the fire activity itself, such as: miles of fuelbreaks, acres to be prescribe burned, fire management costs, ect.